Part 5 of 5

Radiological Assessor Training
DOE-HDBK-1141-2001

Handouts

Office of Environment, Safety & Health
U.S. Department of Energy

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Dosimetric Quantities in 10 CFR Part 835

Term	Definition
Absorbed dose (D)	The energy absorbed by matter from ionizing radiation per unit mass of irradiated material at the place of interest in that material. The absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 gray).
Dose equivalent (H)	The product of absorbed dose (D) in rad (or gray) in tissue, a quality factor (Q), and other modifying factors (N). Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).
Deep dose equivalent	The dose equivalent derived from external radiation at a depth of 1 cm in tissue.
Lens of the eye dose equivalent	The external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm.
Shallow dose equivalent	The dose equivalent derived from external radiation at a depth of 0.007 cm in tissue.
Committed dose equivalent ($H_{T,50}$)	The dose equivalent calculated to be received by a tissue or organ over a 50 year period after the intake of a radionuclide into the body. It does not include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rem (or sievert).

Committed effective dose equivalent ($H_{E,50}$)	The sum of the committed dose equivalents to various tissues in the body ($H_{T,50}$), each multiplied by the appropriate weighting factor (w_T)--that is, $H_{E,50}$ = sum of $w_T H_{T,50}$. Committed effective dose equivalent is expressed in units of rem (or sievert).
Effective dose equivalent (H_E)	The summation of the products of the dose equivalent received by specified tissues of the body (H_T) and the appropriate weighting factor (w_T)--that is, H_E = sum of $w_T H_T$. It includes the dose from radiation sources internal and/or external to the body. For purposes of compliance with this part, deep dose equivalent to the whole body may be used as effective dose equivalent for external exposures. The effective dose equivalent is expressed in units of rem (or sievert).
Total effective dose equivalent (TEDE)	The sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Radiological Control Program Elements

Management oversight

- Management commitment and policy
- Management responsibilities
- Resource and budget development
- Directives, procedures, and manuals
- ALARA and other safety committees
- Emergency response organization
- Control of experimental activities

Radiological control organization

- Organizational independence
- Responsibilities, authorities, and functions
- Staffing levels

Training

- General requirements
- General employee training
- Radiological Worker training
- Radiological control staff qualification
- Operations personnel
- Manager and supervisor
- Respiratory protection
- Medical personnel

Radiological Control Program Elements (cont.)

- Visitors
- Emergency response personnel
- Occupational Safety and Health Administration (OSHA) training

Reviews, audits, and evaluations

- Management overview practices
- Review of incidents
- Internal audits
- Quality assurance program
- Safety analyses and assessments

Oversight of radiological design criteria

- General requirements
- Structural and facility design
- Ventilation systems
- Instrumentation and equipment
- Special tools and enclosures
- Containment systems

Radiological work practices and administrative controls

- ALARA concepts and controls
- Establishment of dose limits
- Emergency plans and procedures

Radiological Control Program Elements (cont.)

- Contamination control work practices
- Planning work
- Posting and access control
- Protective clothing and laundry
- Respiratory protection
- Radiation procedures
- Emergency response actions

Radioactive materials control

- Feed, process, and output materials
- Collection and control of radioactive samples
- Radwaste management
- Contamination materials and equipment
- Sealed radiation sources/calibration sources
- Packaging and labeling for transportation

Dosimetry programs

- General requirements
- External dosimetry
- Internal dosimetry
- Nuclear accident dosimetry
- Quality control

Radiological Control Program Elements (cont.)

Instrumentation and alarms

- General requirements
- Air monitoring and sampling systems
- Effluent monitoring and sampling systems
- Fixed and portable monitoring systems
- Nuclear accident monitoring systems
- Warning and alarm systems

X-ray and source radiography

- General requirements
- Radiological safety
- Testing, operations, and calibration
- Emergency response
- Transporting and receiving sources

Workplace surveys and monitoring

- General requirements
- Dose rate surveys
- Contamination surveys (personnel, airborne, surface)
- Documentation

Radiological Control Program Elements (cont.)

Reporting

- Occurrences
- Operational events and emergency notifications
- Reports on employees' exposure
- OSHA complaints involving radioactive material

Radionuclide-specific guidance

- Uranium
- Plutonium
- Tritium
- Fission products

Radiation-producing machines

- X-ray machines
- Accelerators
- Radiography equipment

Emergency response

- Contamination of workplace
- Contamination of individuals
- Radiation overexposures
- Criticality accidents

Radiological Control Program Elements (cont.)

- Environmental releases
- Loss of radioactive material

Records

- Identification of required records
- Records management program
- Record media
- Record storage criteria
- Computerization of records

Conduct of operations

- Features and controls depend on specifics:
  - Site
  - Job
  - Radionuclide

Data and trend analysis

- Features and controls depend on specifics:
  - Site
  - Job
  - Radionuclide

Elements of a Radiological Control Program

The following pages list typical elements of a Radiological Control Program. The listing of these elements is intended to describe the magnitude of a complete protection program. These elements were derived from several sources.

The list is a generic compilation of program elements and is not intended to describe the program at any specific facility. Effective Radiological Control Programs will vary from site to site and facility to facility based on many factors. These factors include:

- The specific facility mission
- The types and quantities of radioactive materials in use at the site
- The physical and chemical forms of radioactive materials in use at the site
- The physical location of the site in relation to the population centers
- The size of the work force
- The age of the facility
- The original facility design criteria

Some of the elements of a Radiological Control Program are dependent on the specific radionuclides present at a site. For example, internal dosimetry methods are specifically dependent on the type of radionuclide being tested for.

The purpose of this list is to allow the user to compare a specific program with the elements identified here. It is up to the user to integrate the appropriate elements into his/her own site's programs.

Elements of a Radiological Control Program (cont.)

Management oversight of the Radiological Control Program

- Management commitment and policy
- Management responsibilities, authorities, and functions
- Resource and budget development
- Policy communications, directives, procedures, and manuals
- ALARA and other radiological safety committees
- Emergency response organization and responsibilities
- Control of experimental activities involving radioactive materials

Radiological control organization

- Organizational independence and reporting level includes:
  - Organizational charts
  - Reporting chain of the Radiological Control Organization
  - Methods to maintain independence from the operating level
  - Radiological Control Organization's interfaces with the operating organizations
  - Specification of corporate personnel to augment the plant's emergency staff
  - Augmentation by contractor personnel
- Responsibilities, authorities, and functions
- Authorized staffing levels

Training

- General requirements
- General employee training

Elements of a Radiological Control Program (cont.)

- Radiological control staff qualification and training requirements and methods for the following categories of workers:
  - Health Physics Technicians
  - Support technicians (bioassay, dosimetry, count room, calibration)
  - Supervisors
  - Managers
  - Technical support staff

- Radiological Worker training requirements and methods for the following categories of workers:
  - Reactor and nonreactor nuclear facility operators
  - Maintenance personnel
  - Construction personnel
  - Supervisors of radiological workers
  - Exempt personnel and contractor personnel

- Additional radiological training for the following operations personnel:
  - Reactor operators
  - Nonreactor nuclear facility operators
  - Instrument and electronics technicians
  - Fissile material handlers

- Manager and supervisor training requirements

- Respiratory protection training

- Medical personnel training for radiological protection

- Visitor training requirements

- Emergency radiological response training

- OSHA training and instruction

Reviews, audits, and evaluations

- Management overview practices for the following:
  - Triennial management review of procedures
  - Peer review of procedures
  - Management appraisals

Elements of a Radiological Control Program (cont.)

- Review of incidents, exposure data, and industry information

- Internal audits
  - Internal audits
  - Functional appraisals
  - Operational readiness reviews
  - Inspection of construction and operating activities

- Quality assurance program

- Safety analysis and assessment reviews

Radiological control organization's oversight of radiological design criteria

- General requirements

- Structural, surface, and facility design
  - Compartmentalization
  - Layout to regulate flow of material and personnel
  - Permanent and temporary shielding
  - Control of traffic patterns
  - Radiological zoning
  - Drainage basins
  - Design location of change rooms and shower facilities
  - Decontamination facilities

- Ventilation system design, air cleanup systems, and other design elements, including:
  - Exhaust systems
  - Piping systems for radioactive liquids
  - Ducts
  - Conduits
  - High Efficiency Particulate Air (HEPA) Filters
  - Valves
  - Pumps

Elements of a Radiological Control Program (cont.)

- Instrumentation and equipment design or selection for the following:
  - Computer systems
  - Process control instrumentation
  - Alarms and warning systems
  - Auxiliary lighting
  - Communication systems

- Design of special tools and enclosures including:
  - Glove boxes
  - Hoods
  - Tents
  - Robotics
  - Remote manipulators
  - Portable temporary ventilation systems

- Containment systems

Radiological safety work practices and administrative controls

- General ALARA concepts and controls, including:
  - Overall concept of keeping exposures ALARA
  - Setting and reestablishing person-rem goals
  - General methods of achieving ALARA goals
  - Basic principles of time, distance, and shielding
  - Documenting and maintaining trend analyses of historical exposure data, job-specific dose estimates, and experiences

- Establishment and control of individual and collective dose limits, including:
  - Regulatory limits to workers
  - Administrative limits to workers
  - Derived air concentrations
  - Limits of radionuclides in drinking water in controlled areas and external sources
  - Limits for annual effective dose equivalent for fetuses (for consistency with instructor's guide), students, and those under 18 years of age
  - Limits and policies for controlling exposure to pregnant women
  - Documentation of planned special exposures exceeding annual effective dose limits in unusual situations (nonemergency)
  - Limits for emergency rescue and recovery operations

Elements of a Radiological Control Program (cont.)

- Emergency plans and procedures
  - Guidance on the periodic conduct of emergency drills
  - Basic requirements for the availability and accessibility of emergency equipment and supplies
  - Lifesaving procedures

- Radiation and contamination control work practices
  - Adherence to procedures, Radiological Work Permits, status boards, and special job plans
  - Designating low-dose waiting areas
  - Location of drinking water fountains
  - Eating, smoking, and drinking in controlled areas
  - Assigning health protection inspectors for radiological job coverage
  - Personnel decontamination methods
  - Miscellaneous work performance methods, preparation of work areas, cutting of systems and components, and venting and draining methods
  - Radiological maintenance exposure reduction methods
  - Practices to avoid skin contamination (other than protective clothing)
  - Log for shift and daily activities

- Planning, preparing, and scheduling work
  - Developing exposure estimates based on previous history on time and dose rate estimates
  - Using accurate exposure estimates
  - Controlling the number of personnel used to perform work
  - Determining the stay time of workers
  - Providing adequate equipment, tools, and procedures at the task site
  - Establishing a collective exposure level
  - Establishing facility-specific radiological exposure goals for each job estimated to exceed a preestablished exposure action level, maximum individual radiological exposure, and person-rem received in repetitive jobs that result in a significant accumulation of exposure
  - Conducting pre- and post- job briefings
  - Using mock-up equipment and performing dry runs
  - Establishing a plan to document pertinent information for an ultimate decontamination and decommissioning activity

Elements of a Radiological Control Program (cont.)

- Radiological posting and access control
  - Identification of entrances to radiological areas and establishment of entrance requirements for each type of area
  - Placement and use of step-off pads
  - Radiation level marking on tags and status boards
  - Consistency of measurements used when marking radiation levels
  - Specification of airborne contamination limits
  - Tagging, roping, and barricading radiological areas
  - Posting and maintaining radiation symbols and status boards
  - Using interlock and air lock functions
  - Posting types and policies for use
  - Meaning of alarm signals and actions to be taken

- Protective clothing and laundry
  - Conditions under which protective clothing is worn
  - Types of protective clothing
  - Donning protective clothing (proper dressing out)
  - Removal of protective clothing
  - Proper disposal of protective clothing
  - Use of change rooms and clothing bins
  - Storage, laundering, monitoring, and reuse of protective clothing
  - Proper segregation of contaminated clothing
  - Laundry facilities, responsibilities, and procedures

- Respiratory protection program
  - Respirator protection factors
  - Application of types of respirators
  - Physical limitations for a proper seal (e.g., eyeglasses, beards)
  - Storage and use of respiratory equipment

- Policy and methods for the development of radiological safety and operating procedures

- Emergency response actions

Elements of a Radiological Control Program (cont.)

Radioactive materials control

- Feed, process, and output materials

- Practices for the collection and control of radioactive samples
  - Types of samples to be collected
  - Analyses performed on each sample
  - Sampling and analysis schedule
  - Sample collection points (access, shielding, ventilating)
  - Liquid and gaseous samples
  - Routine grab samples
  - Remote systems to collect containment and dry well samples
  - Chain-of-custody records for each sample

- Radioactive waste and waste management
  - Segregation of uncontaminated waste from contaminated waste
  - Waste processing systems (including operational envelope for decontamination factors, radionuclide concentrations, and equipment specifications)
  - Disposal methods, burial grounds
  - Waste-handling capabilities for decontamination solutions, contaminated oil and organics
  - Release rates, compliance with technical specification limits, total activity release, total volume release
  - Sanitary waste segregation
  - Drainage from personnel decontamination and safety shower water runoff
  - Labeling of waste containers, such as 55-gallon drums
  - Record keeping

- Contaminated materials and equipment
  - Tagging of tools and materials
  - Vacuum cleaners in contaminated areas or potentially contaminated areas

- Sealed radiation sources/calibration sources
  - Inventory practices
  - Leak testing
  - Record keeping

- Packaging and labeling for transportation of radioactive material

Elements of a Radiological Control Program (cont.)

Dosimetry program

- General requirements
  - Components of a dosimetry program
  - Monitoring the dosimetry program
  - Maintenance of exposure records

- External dosimetry
  - Selection and testing of the proper dosimetry device DOE Laboratory Accreditation Program
  - Control and use of:
    + Thermoluminescent dosimeters (TLDs)
    + Pocket dosimeters, self-reading dosimeters
    + Personnel alarm dosimeters
    + Nuclear track emulsions
    + Track etch
    + Whole-body dosimetry
    + Extremity dosimetry
    + Neutron dosimetry
  - Actions for lost dosimetry, unexpected results, or other abnormal situations

- Internal dosimetry
  - Selection of the proper internal dosimetry methods
  - Policies and methods for:
    + Whole-body counting
    + Thyroid counting
    + Lung counting
    + Urinalysis
    + Fecal analysis
    + Blood activity
    + Nasal swipes
    + Use of air monitoring results

  - Determination of dose based on internal dosimetry results

- Nuclear accident dosimetry

- Quality control for dosimetry

Elements of a Radiological Control Program (cont.)

Radiological safety instrumentation and alarms

- General requirements
  - Acquisition
  - Receipt and testing
  - Implementation
  - Maintenance and functional checks
  - Calibration and calibration facility requirements
  - Audible and visual indicator alarms
  - Documentation and record keeping requirements

- Air monitoring and sampling systems
  - Policies and use for:
    + Continuous air monitors
    + High-volume air samplers
    + Low-volume air samplers
    + Halogen-absorbing cartridge or filter
    + Silver zeolite cartridge or filter
    + Impingers
    + Personnel label samplers
    + Kanne chambers and other tritium monitors
    + Leak detectors
    + Breathing zone sampling equipment
  - System design and performance to national consensus standards
  - Airflow studies and source characterization
  - The use and control of filtering media
  - Source-term characteristics
  - Proper placement and operation of equipment
  - Documentation and record keeping requirements

- Effluent monitoring and sampling systems for:
  - Stack monitors
  - Off-gas monitors
  - Exhaust fans
  - Filter compartments
  - Filter flappers
  - Dampers

Elements of a Radiological Control Program (cont.)

- Fixed and portable dose rate and contamination monitoring instruments
  - Policies and controls for the use of radiation detectors
    + Photon, neutron, beta, alpha monitors
    + Proportional and scintillation counters
    + Count rate meters
    + Ion chambers
    + Geiger-Mueller tubes and counters
    + Hand and shoe counters, pancake monitors
    + Portal monitors
    + Chest counters
    + Area radiation monitors
    + Small dimension probes for wound monitors
  - Testing
  - Calibration schedule and standards
  - Functional checks
  - Maintenance
  - Storage
  - Inventory
  - Documentation and record keeping

- Nuclear accident monitoring systems
  - Nuclear incident monitors
  - Criticality monitors
  - Emergency radiological instrumentation systems for criticality incidents

- Warning and alarm systems
  - Periodic testing of the alarms
  - Alarm use in practice drills
  - Alarm panels and indicators
  - Type and placement for each facility/area
  - Calibration
  - Audible and visual indicators
  - System backup in the event of loss of power

Elements of a Radiological Control Program (cont.)

X-ray and source radiography

- General requirements
- Radiological safety
- Testing, operations, and calibration
- Emergency response
- Transporting and receiving radiography sources

Workplace surveys and monitoring

- General requirements
  - Survey frequencies (continuous monitoring, follow-up surveys)
  - Survey of routine and nonroutine activities
  - Monitoring conditions
  - Points at which monitoring will be required
  - Survey and monitoring techniques and methods
  - Implementation of a comprehensive routine surveillance program for radiation, contamination, and airborne surveys
- Schedules, policies, and control of dose rate surveys (routine, nonroutine, emergency)
- Schedules, policies, and practices for contamination surveys (personnel, airborne, and surface)
  - Monitoring workers during and following work
  - Surveys of gloves
  - Techniques for self-monitoring upon exit
  - Accessibility of exit monitoring equipment, surveys for loose surface contamination
  - Accuracy of detection (amount and source identification)
  - Personnel air sampling (breathing zones)
  - Procedures to follow when contamination is detected
  - Participation of health physics staff in developing, implementing, and auditing the survey and self-monitoring program
  - Smearable radioactive contamination
  - Surveys of injured personnel
- Documentation and record keeping requirements

Elements of a Radiological Control Program (cont.)

Reporting

- Unusual occurrences
- Operational events and emergency notifications
- Reports on employee exposures
- Occupational safety and health complaints involving radioactive material

Development of radionuclide-specific guidance for:

- Uranium
- Plutonium
- Tritium
- Fission products

Radiation-producing machines

- X-ray machines
- Accelerators
- Radiography equipment

Elements of a Radiological Control Program (cont.)

Radiological accidents and emergency response

- Contamination of workplace
- Contamination of individuals
- Radiological overexposures
- Criticality accidents
- Environmental release
- Loss of radioactive material

Records maintenance requirements

- Identification of required records
- Records management program
- Record media
- Record storage criteria
- Computerization of records

Conduct of operations as it relates to radiological protection

Data and trend analysis

Typical Safety Analysis Report (SAR) Contents

Introduction

Site Characteristics

Principal Safety Criteria (Success Criteria)

Process/Operations Descriptions

Waste Processing and Handling

Buildings, Structures, and Support Systems

Safety- and Nonsafety-Class Components (including engineered safety features)

Comparison with Criteria (including backfitting)

Special Safety Interest

Hazard Analysis and Classification

Assessment of Normal Operations

Analysis of Abnormal Conditions and Accidents

Derivation of Technical Safety Requirements

Management and Institutional Safety Provisions

Facility Safety Programs

Conduct of Operations

Maintenance Management

Testing and In-Service Surveillance

Procedures

Employee Selection and Training

Typical Safety Analysis Report (SAR) Contents (cont.)

Human Factors–Machine Interface

Emergency Preparedness

Provisions for Decontamination and Decommissioning

Quality Assurance

Technical Safety Requirement (TSR) Format and Content

Format/sections (hierarchy of requirements)

1. Use and Applications
2. Safety Limits
3. Operational Limits
4. Surveillance Requirements
5. Administrative Controls
6. Appendices

1. Use and application

   This section should contain basic information and instructions for using and applying the individual TSRs. Use and application include the following elements:

   a. Definitions (Specifically defined terms are to appear in uppercase type throughout the TSR document.)
   b. Operational Modes
   c. Logicalk Connections
   d. Completion Times
   e. Frequency Notations

2. Safety Limits (SLs)

   SLs should describe as precisely as possible the parameter being limited and state the limit in measurable units.

   a. Applicability

      Each SL is to have a mode applicability statement.

Technical Safety Requirement (TSR) Format and Content (cont.)

b. Actions

Action statements are to completely describe the actions to be taken in the event that the SL is not met.

c. Selection of SLs

SLs are those limits which, if exceeded, could directly cause the failure of one or more of the barriers that prevent the uncontrolled release of radioactive or other hazardous materials.

Combined Section 3/4

Within the TSR document, Section 3 delineates the Operational Limits, and Section 4 describes the Surveillance Requirements. There is usually a one-to-one correlation between the operational limits and the surveillance related to each. Thus, for convenience, each limit is typically presented at the same place as its related surveillance, and the combined information is designated Section 3/4.

This combined section should contain the Limiting Control Settings and the Limiting Conditions for Operation, as well as mode applicability information, Action Statements, and Surveillance Requirements, for each requirement.

3. Operational Limits (OLs)

The initial conditions of the safety (accident) analyses upon which the authorization to operate is based are the least conservative limits of acceptable operation. These initial condition values must be adjusted for both instrument error and the expected instrument drift between surveillances, and an allowance should be made for calculational uncertainties prior to being used as limits in the TSRs.

The most conservative value for each parameter contained in the safety analyses makes up the envelope within which the facility must operate in order to ensure that the SAR analyses found safe operations. Provided the facility is operated within these SAR initial condition limits, the SAR results accurately demonstrate that the consequences of accidents/transients/incidents are acceptable.

Technical Safety Requirement (TSR) Format and Content (cont.)

a. Limiting Control Settings (LCSs)

   LCSs should describe, as precisely as possible, the parameter being controlled and its limits, or the limiting setting of the device to control it.

b. Limiting Conditions for Operation (LCOs)

   The LCO statement describes, as precisely as possible, the lowest functional capability or performance level or equipment required for continued safe operation of the facility.

   Other elements to be address under OLs include:

c. Applicability (mode applicability)

d. Action (Action Statement in the event the LCS or LCO is not met)

e. Surveillance Requirements

f. LCSs of instruments that monitor process variables at nonreactor nuclear facilities (NNFs) are the settings that either initiate protective devices themselves or sound an alarm to alert personnel to take action in order to protect barriers that prevent the uncontrolled release of radioactive materials.

g. Selection of LCOs (for NNFs) should be written only for systems and equipment that meet one (or more) of the following descriptions:

   - Installed instrumentation that is used to detect and indicate in the control room or other control location an inadvertent criticality or a significant degradation of the physical barriers that prevent the uncontrolled release of radioactive materials

   - Structures, systems, and components that are relied upon in the SAR to function or actuate to prevent or mitigate accidents, or transients that either involve the assumed failure of, or present a challenge to, the integrity of a physical barrier that prevents the uncontrolled release of radioactive materials

Technical Safety Requirement (TSR) Format and Content (cont.)

- Process variables that are initial conditions for those design basis accidents or transient analyses which involve the assumed failure of, or present a challenge to, the integrity of a radioactive material barrier.

- Systems and equipment that are used for handling fissile material

The term **unusual conditions** is made clear in the final rule by specifying that alternatives which would preclude exposures higher than the prescribed dose limits must be either unavailable or impractical.

h. Special test exceptions may be allowed under controlled conditions.

4. Surveillance Requirements (SRs)

   SR Statements consist of short descriptions of each requirement and its frequency of performance. A frequency of performance is mandatory. These statements should be as brief as possible, but should identify those requirements needed to ensure compliance with the LCS or LCO. Each Surveillance Requirement should begin with a verb. Consistency in the use of terms and sentence structure between requirements is important.

5. Administrative controls (ACs)

   This section should impose administrative requirements necessary to control operation of the facility such that it meets the TSRs. These include:

- Contractor Responsibility
- Contractor Organization
- Procedures
- Programs
- Minimum Operations Shift Complement
- Operating Support
- Staff Qualifications and Training
- OPERABILITY Definition and Implementation
- TSR Basis Control
- Reviews and Audits
- Reporting Requirements

Technical Safety Requirement (TSR) Format and Content (cont.)

6. Appendices

   - The Bases Appendix shall provide brief summary statements of the reasons for the SLs, OLs, and associated SRs. The bases shall show the numeric values, the conditions, the surveillances, and the Action Statements that fulfill the purpose derived from the safety documentation. The primary purpose for describing the basis of each requirement is to ensure that any future changes to the requirement will not affect its original intent or purpose.

   - The purpose of the Design Features Appendix is to describe in detail those features not covered elsewhere in the TSRs which, if altered or modified, would have a significant effect on safety. Three areas should be addressed: vital passive components, configuration and physical arrangement, and materials.

   Numbering System within the TSR Document

   Safety Limits

   SLs should begin with 2.1 and continue with 2.2, 2.3, etc.

   Operational Limits

   OLs begin with 3.1 and continue with 3.2, 3.3, etc. Any subdivision of OLs should be numbered with an additional number added to the number of the LSC, i.e., 3.2.2, 3.2.3, etc. OLs should be grouped by principal system or function, and each OL within a group should be numbered sequentially. LCSs are normally the first requirement within a group.

   For NNFs, a standardized grouping of requirements may be difficult because of the diversity of facility types. However, many will have the following subdivisions:

   - Applicability
   - Criticality, Radioactivity, and Hazardous
   - Confinement/Ventilation
   - Fire Detection and Suppression
   - Emergency Power
   - Chemical Systems
   - Instrumentation
   - Experimental Facilities

Technical Safety Requirement (TSR) Format and Content (cont.)

Surveillance Requirements

SRs should be designated with numbers beginning with 4. The second number should correspond to the same grouping scheme utilized for the LCS or the LCO, and the third number in the sequence indicates the LCS or the LCO that this surveillance supports. Hence, the SR will have numbers the same as the corresponding LCS or LCO, except for the first number, which will be a “4” instead of a “3.”

Bases (Bases Appendix)

Bases are numbered in accordance with the SL, LCS, or LCO that they support.

Field Exercise Guidelines for Participants

You are to apply performance-based assessment techniques in the field. It is important that the exercise be flexible and broad. Therefore, you should be given the "controlled" freedom to move about in the facility. Sufficient personnel should be available for interaction and to answer any questions.

- After being issued security and dosimetry badges, you will observe a practice radiological control assessment performed by your field instructor.

- Following lunch, you will have the opportunity to conduct the assessment under the observation of your field instructor. He/she will give you "on the spot" guidance and help you individually at times.

- The aim of this field exercise is to demonstrate recommended methods and techniques of conducting radiological control assessments in the field by giving you some practice.

- You will spend several hours in a facility. The emphasis shall be on assessing proper radiological protection practices, policies, and procedures.

- You are to practice assessing by selecting an item or area and delving into it. It is important to practice the identification of surface issues (Type I), but more important to deal with the underlying issues (Types II and III).

- You will be performing a review of an issue, procedure, program (like ALARA), or system walk-down. You may observe a routine evolution, a test, or some maintenance job.

- Be alert to any routines, tests, or maintenance taking place during your facility visit. These give the best opportunity to see how the people do their jobs.

- Be alert to waste minimization and prevention. Always question material use and the discharge of materials to waste streams or the environment.

- Be alert to leaks or discharges of any kind.

- Work at looking at the big picture for issues such as minimization of controlled areas and control of work, personnel, and dose.

- During the evening, you will be writing one item as a concern or finding to present at the debrief on Friday morning. Therefore, you need to support the finding with what requirement exists and why your concern or finding is valid.

Field Exercise Guidelines for Participants (cont.)

- In the morning debrief, you will present your finding or issue for practice.
- It is important that you coordinate with the other members of your group so you present different findings/observations.
- You will have one and one-half minutes or so to present your finding.
- You should present your finding in this format:

  1. This is the requirement.
  2. Contrary to the requirement, this is what was noted.
  3. Therefore, I/we have the following concern/finding.

- Don't count on the people to whom you are presenting your finding to recognize what is wrong; you must justify it in enough detail that there is no doubt (make your case).
- Your field instructor will take care of thanks to the facility personnel during the debrief. (It takes too much time if each person does it.)
- Your instructor will collect your completed written finding at the completion of the class debrief.

Radiological Assessor Training
DOE-HDBK-1141-2001

CONCLUDING MATERIAL

Review Activity:

DOE
DP
EH
EM
NE
SC
GC
IA
RW
NN

Field Offices
RF
ID
SR
OH
RL

National Laboratories
BNL
LLNL
LANL
PNL
Sandia
ANL
New Brunswick
ORNL

Operations Offices
AL
NV
OAK
OR
CH

Area Offices
Amarillo Area Office
Kirtland Area Office
Princeton Area Office
Fernald Area Office
Kansas City Area Office
Miamisburg Area Office

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